



Comparisons of TES temperature with aircraft, AIRS and sondes

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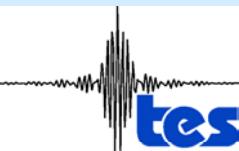
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TES temperature retrievals

- This is a status report on TES v002 temperature, the version available at the DAAC.
- TES error bars shown are the observational errors (random plus cross-state errors).
- TES retrievals shown here have been selected for retrieval quality flag = 1.





TES temperature comparisons: AIRS

A. Eldering and the TES team



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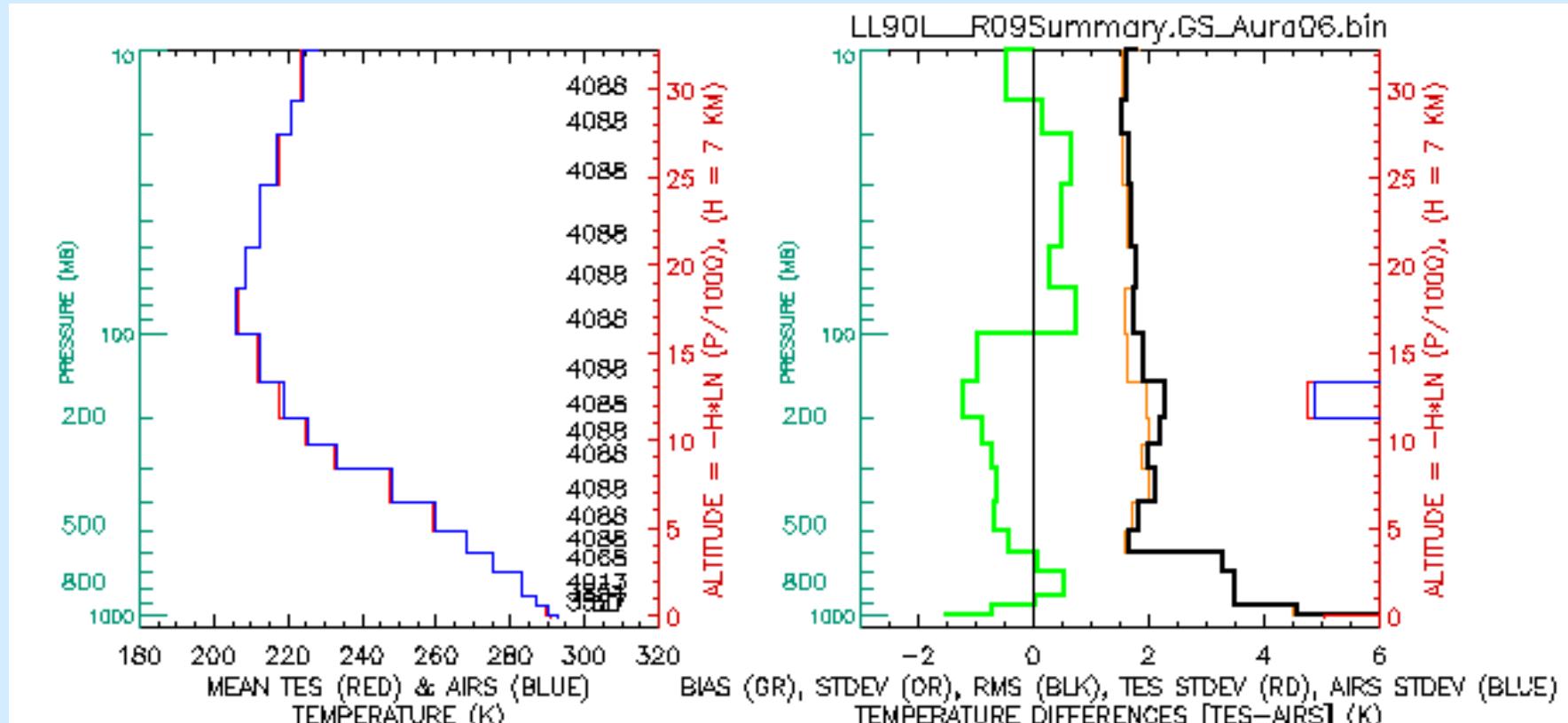
The data sets and approach

- TES data
 - Global Surveys (GS), 8x5 km footprint.
 - v002
 - Used recommended data quality screening.
- AIRS data
 - Closest match to TES, but note that retrievals are on 45-km diameter footprint.
 - Used only QA_TEMP_BOT = 0 quality flag.
 - Using v4.0

Matched closest AIRS to TES observations,
interpolated TES data to AIRS retrieval levels



TES (GS) vs AIRS



Mean profiles

TES - AIRS



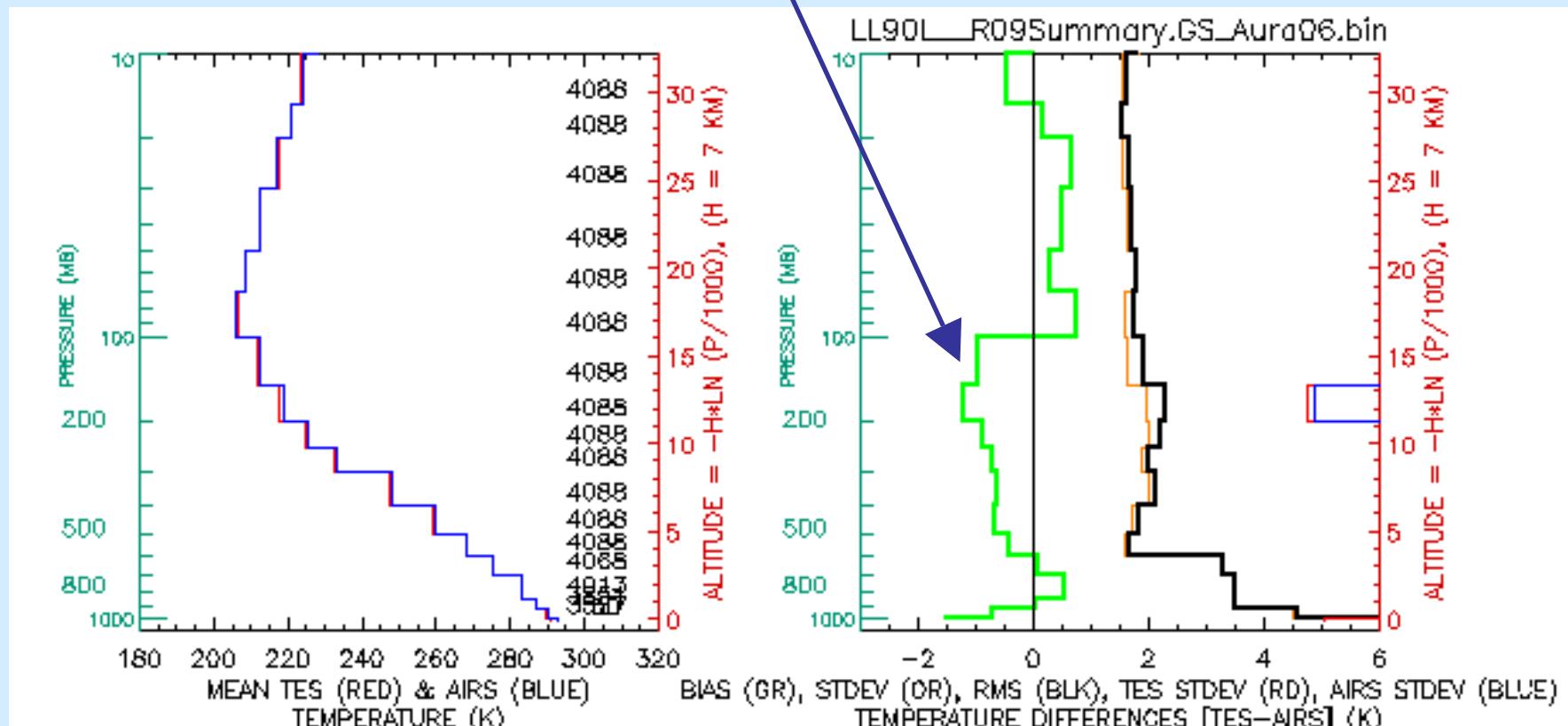
Bias in green [TES-AIRS],
rms differences in black

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TES (GS) vs AIRS

TES cold bias -0.5 to -1.2 K at 100-600 hPa relative to AIRS.



Mean profiles

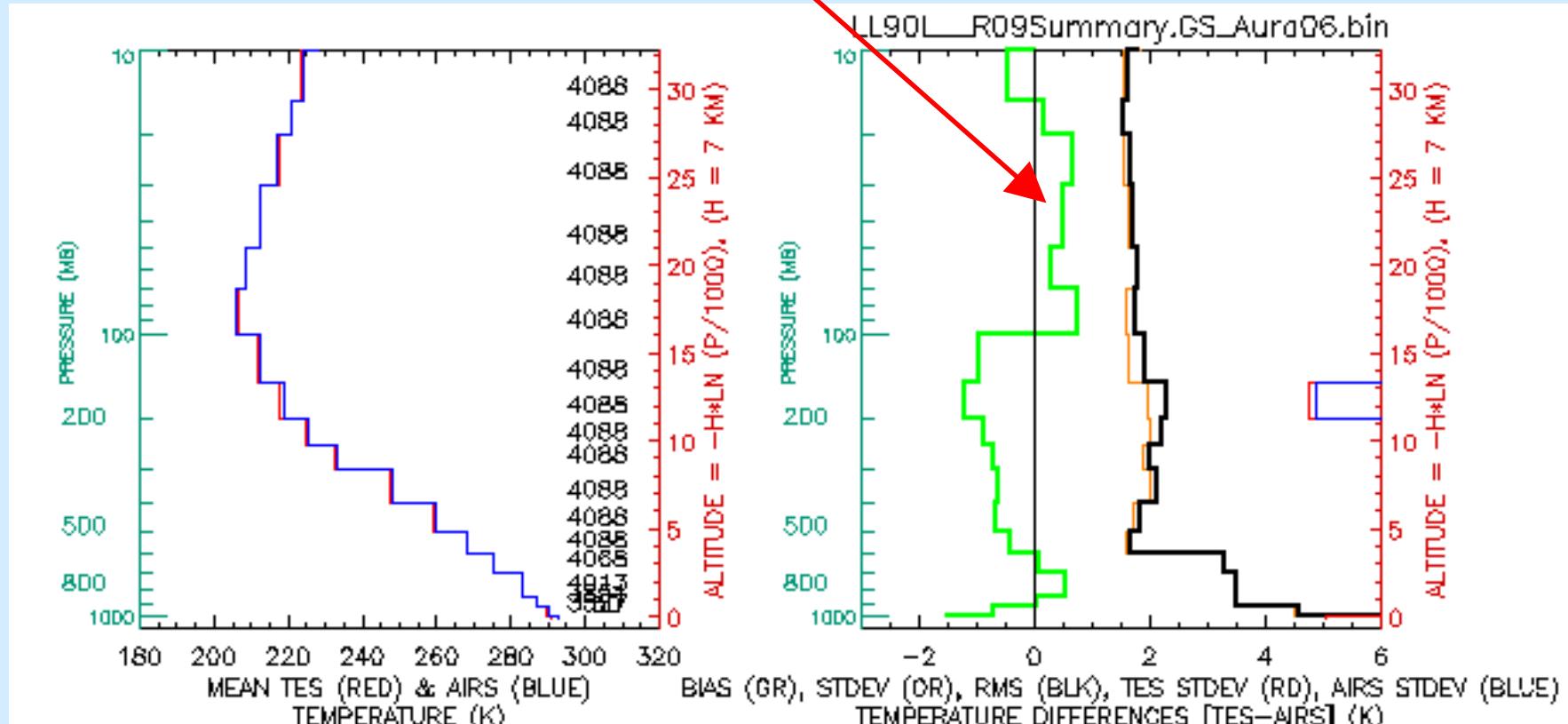
TES - AIRS

Bias in green [TES-AIRS],
rms differences in black



TES (GS) vs AIRS

TES warm bias 0.0 to +1.5 K at 20-100 hPa relative to AIRS.



Mean profiles

TES - AIRS



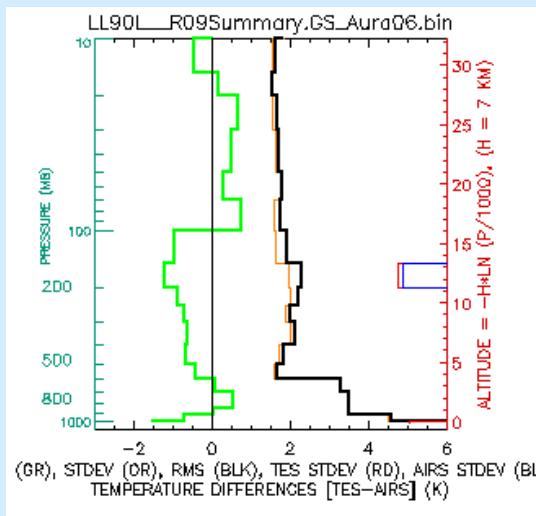
Bias in green [TES-AIRS],
rms differences in black



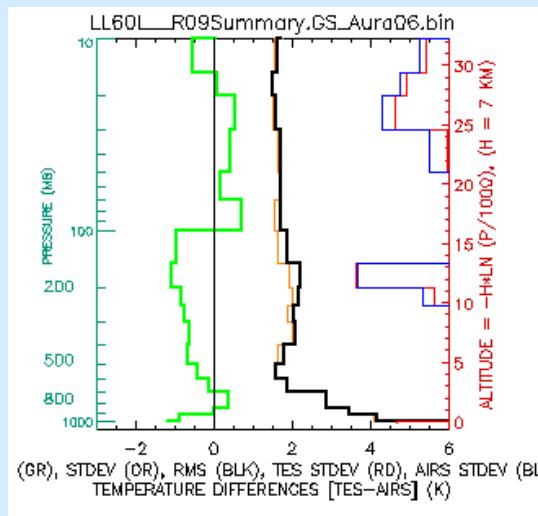
TES (GS) vs AIRS

- TES cold bias -0.5 to -1.2 K at 100-600 hPa relative to AIRS.
- TES warm bias 0.0 to +1.5 K at 20-100 hPa relative to AIRS.
- Little latitudinal dependence seen:

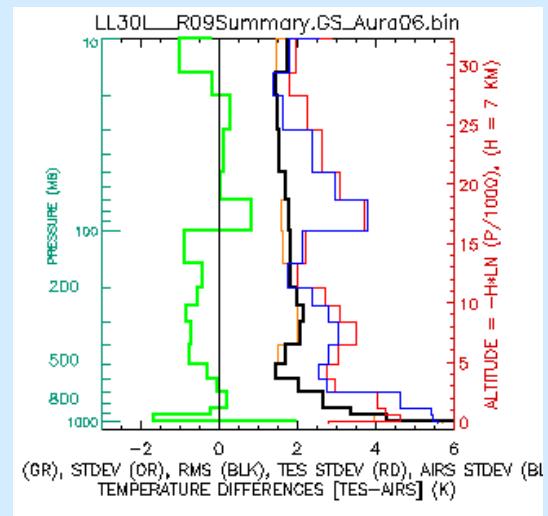
90S-90N



60S-60N



30S-30N





TES temperature comparisons: aircraft (MTP and in-situ)

M. J. Mahoney and the TES team



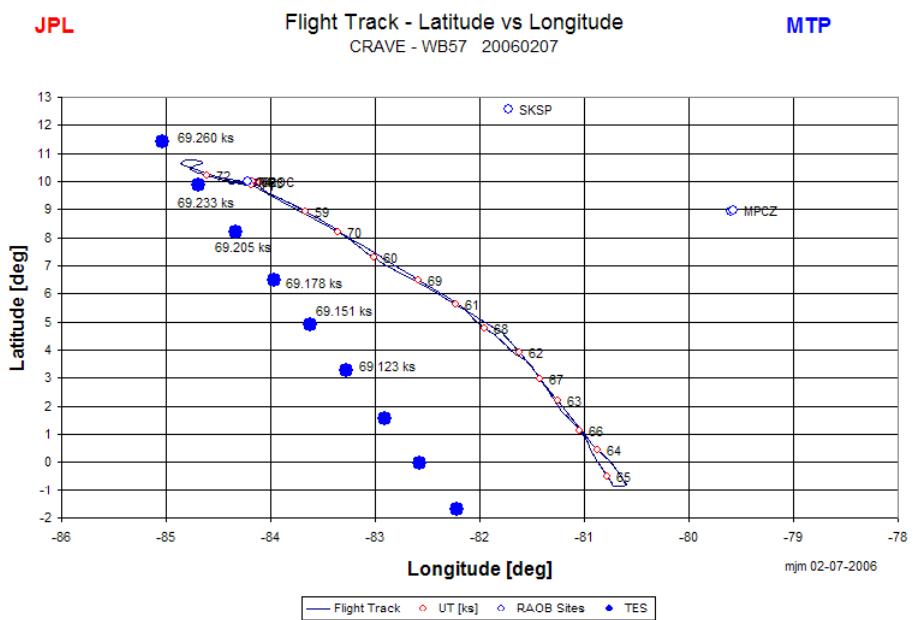
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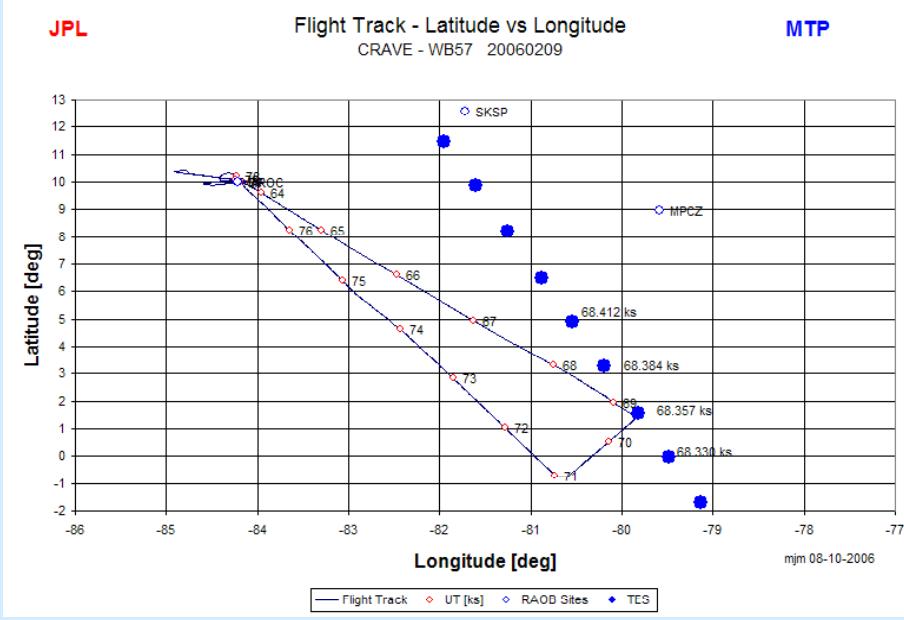


CR-AVE coincidences

7 Feb 2006:

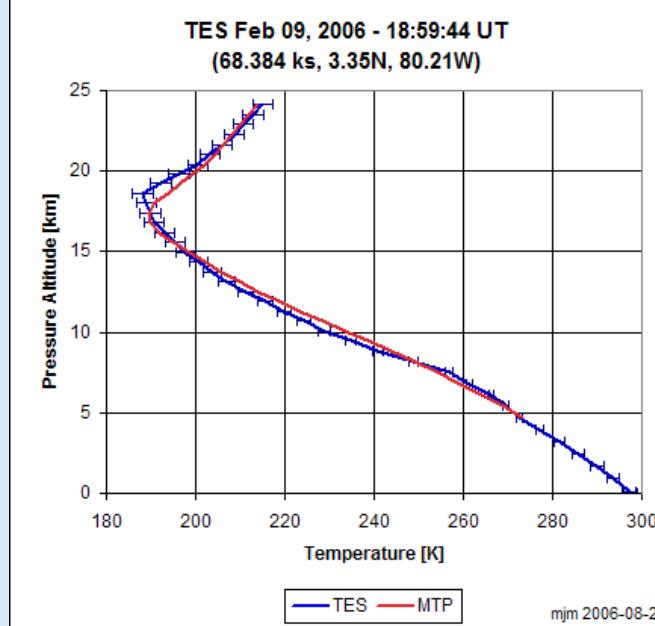
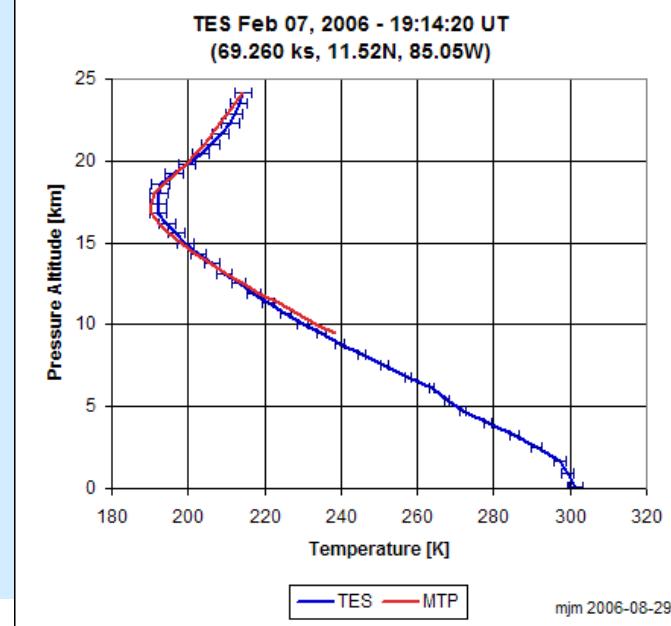
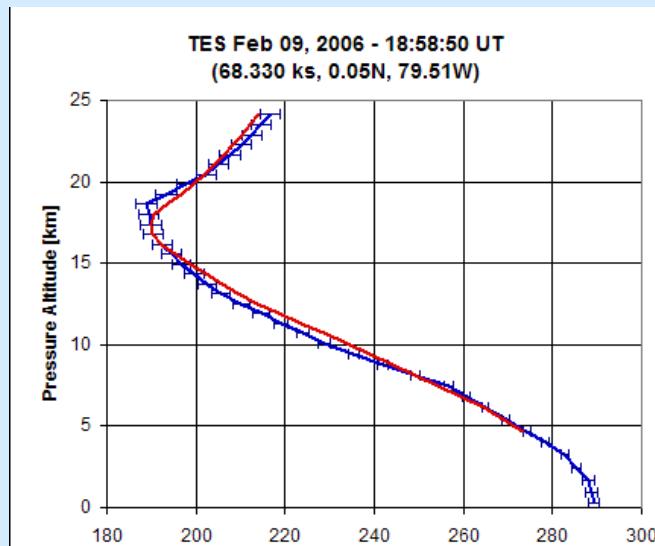
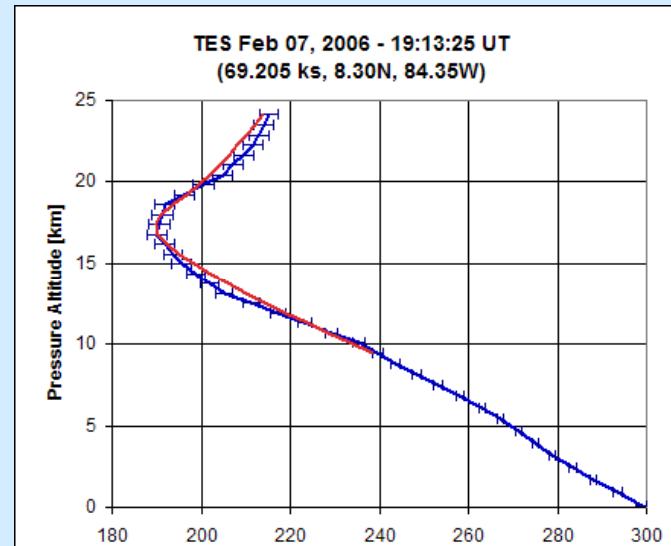


9 Feb 2006:

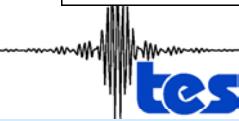


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Microwave Temperature Profiler (MTP) comparison by M. J. Mahoney



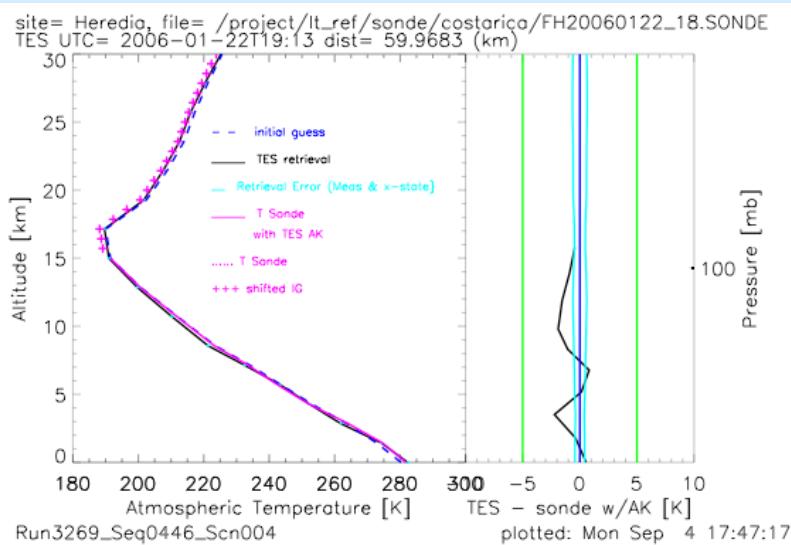
TES is
colder
than
MTP in
the UT.



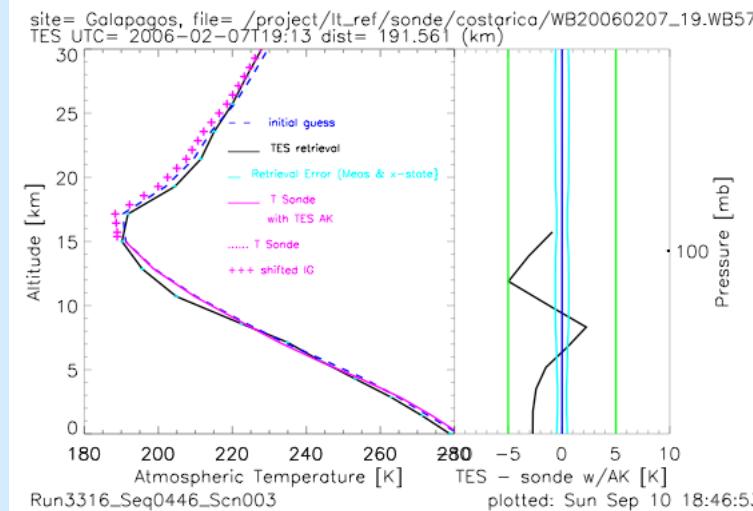
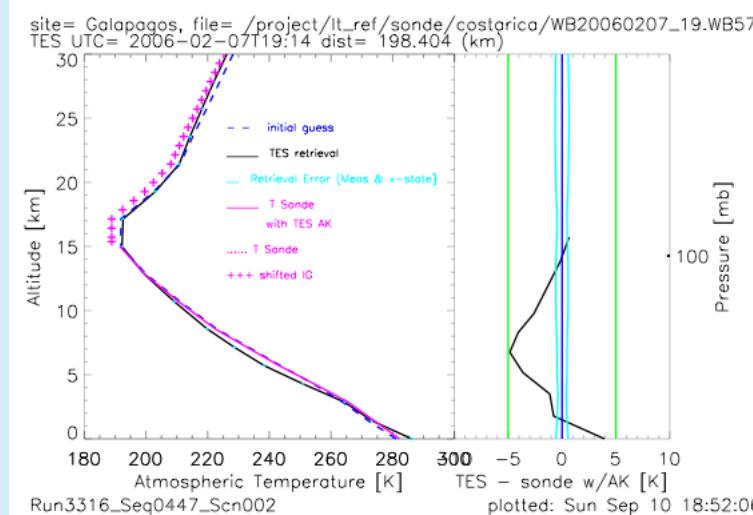
Comparison with aircraft in-situ T

- WB-57F MMS and PT aircraft in-situ T from CR-AVE.
- Mean TES - sonde with averaging kernel (black line on right).
- TES cold bias in middle to upper troposphere.

22 Jan 2006 takeoff



7 Feb 2006 spiral descent





TES temperature comparisons: sondes

R. Herman, B. Fisher, M. Shephard (AER),
and the TES team



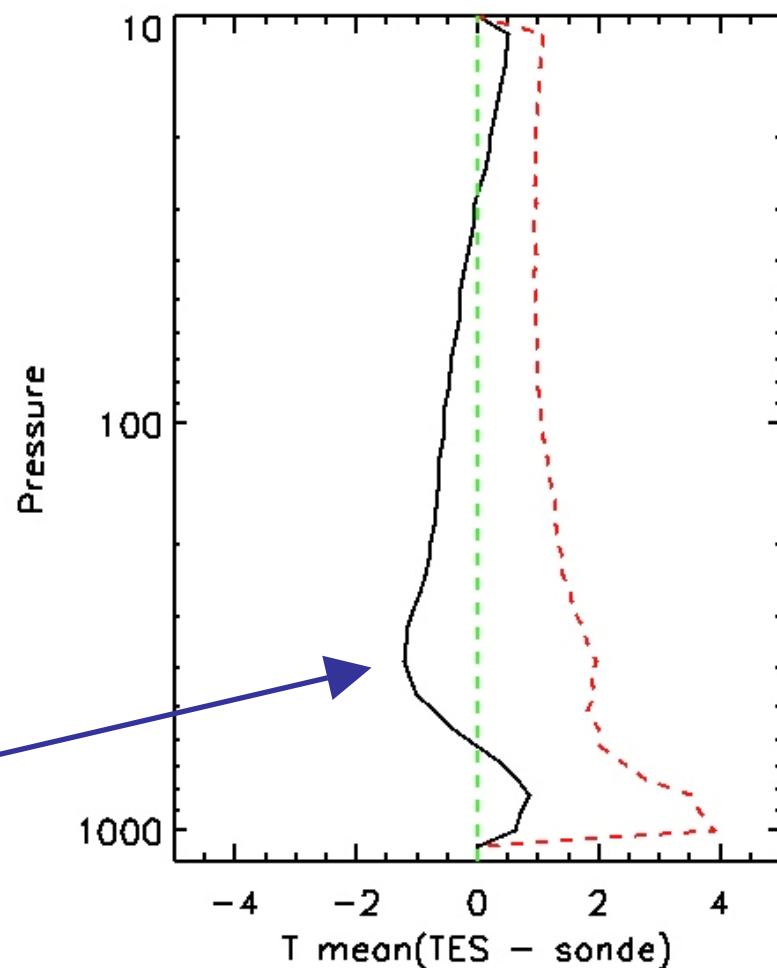
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TES vs NCEP sondes

(figure provided by Brendan Fisher)

- Coincidence criteria: within 2 hours and 2 degrees proximity of TES retrievals.
- Compared to four TES global surveys (March 1-8, 2006).
- 706 sondes (all types) with TES averaging kernel.
- Bias, TES - sonde (black), RMS (red).
- TES cold bias in UT and LS of 0 to -1.2 K at 30-600 hPa.



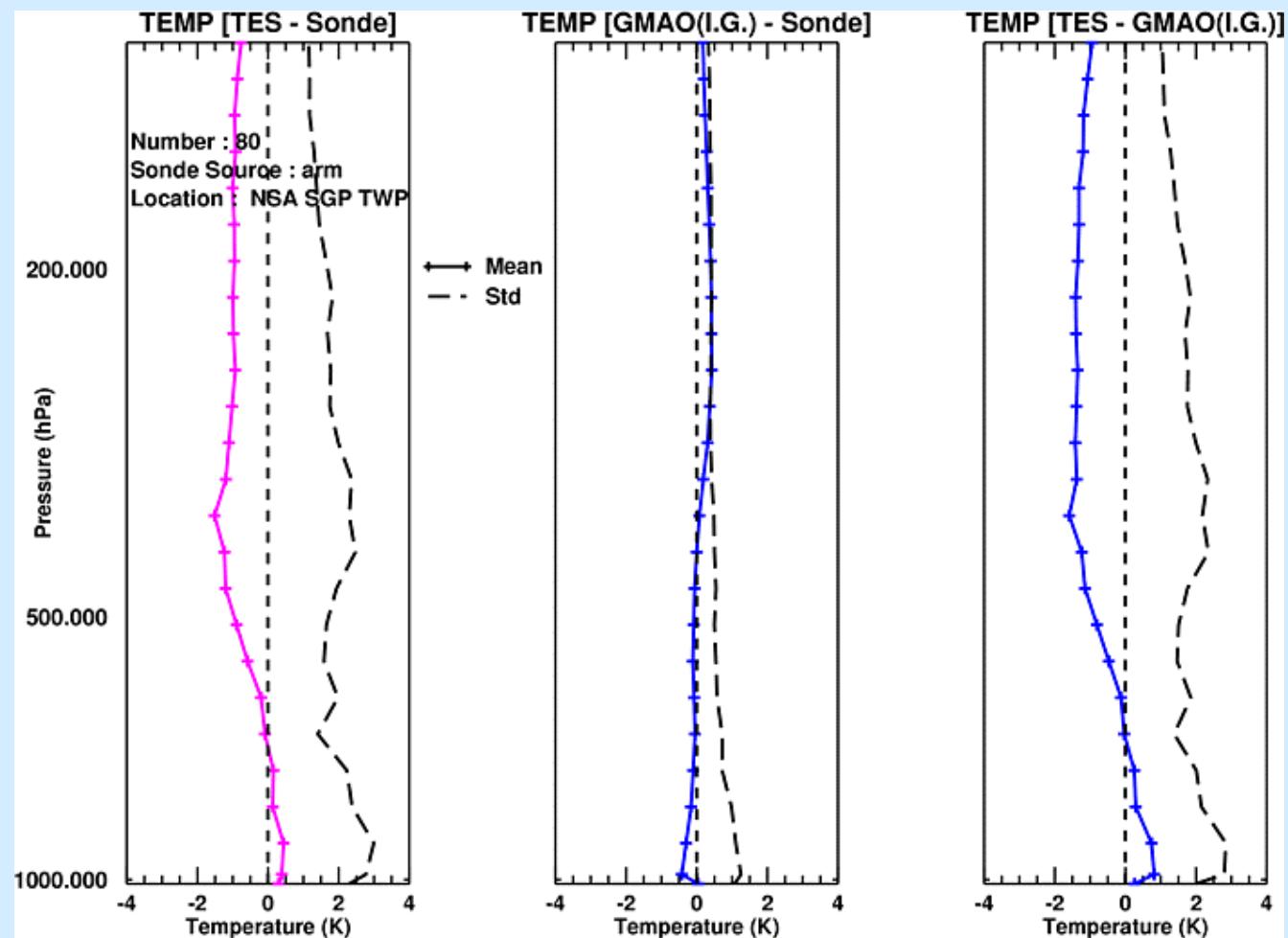
TES vs ARM sondes

80 radiosondes
 (RS90 and RS92)
 compared with
 TES special obs
 at the ARM sites.

Coincidence
 criteria:
 within 2 hours
 and 250 km of
 the sonde launch.

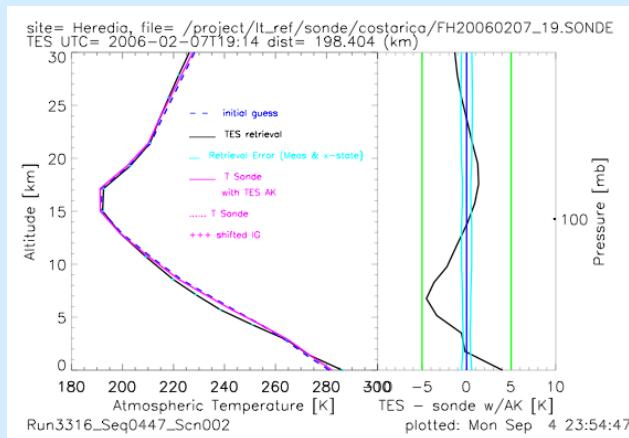
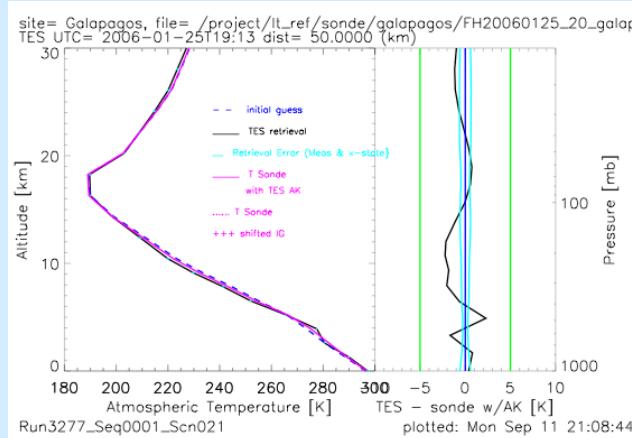
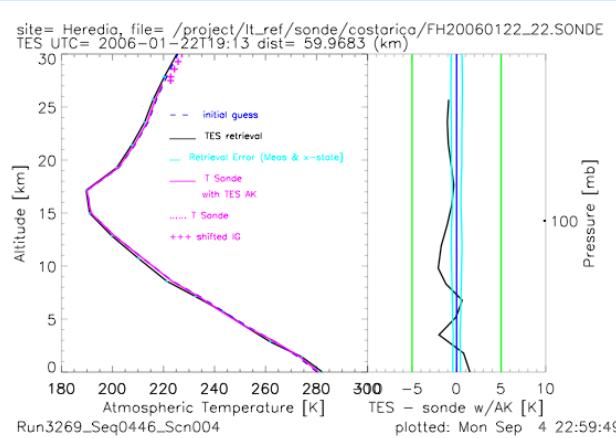
TES ~1 K cold
 bias in the UT
 relative to sondes
 and GMAO.

(figure provided by Mark Shephard)



TES vs Ticosonde

- Sondes (Vaisala RS92-SGP) launched during the Ticosonde/CR-AVE 2006 Project.
- Timing coordinated with nearby Aura overpass.
- Mean TES - sonde with averaging kernel (black line on right).

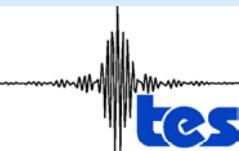


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Summary

- v002 TES T has a cold bias relative to AIRS of -0.5 to -1.2 K at 100-600 hPa. This is consistent with other comparisons to sondes, aircraft, and GMAO.
- The next release (v003) of TES is coming! It will have improved T due to inclusion of CO₂ spectroscopy (see Radiances subgroup talk by Mark Shephard).
- Future validation needs: TES limb temperature validation and high-latitude correlative measurements.





Acknowledgments

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Special thanks to Helen Worden, Annmarie Eldering, Susan Kulawik, Brendan Fisher, Michael Gunson, and Kevin Bowman for helpful suggestions.

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Backup slides



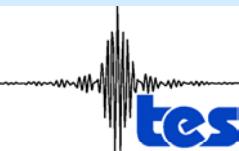
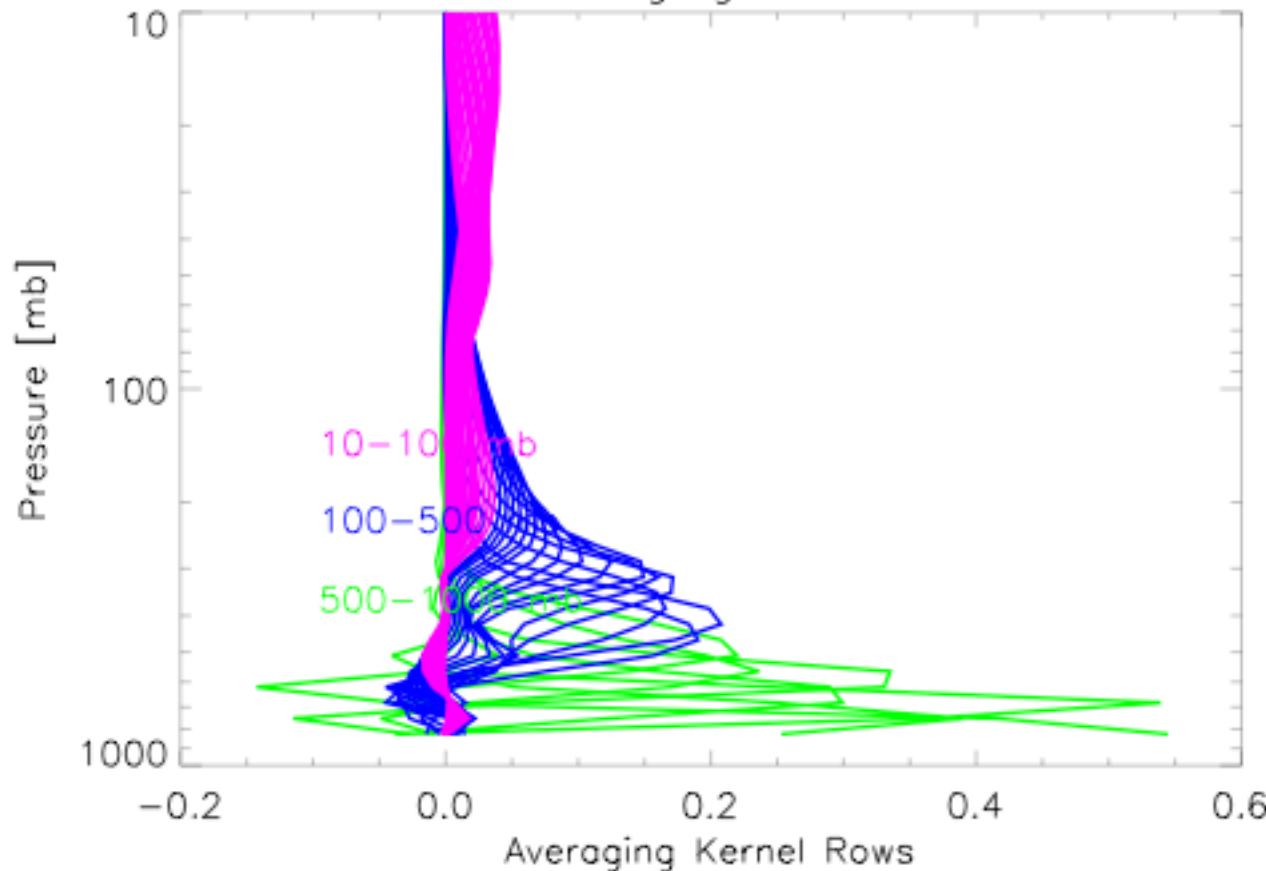
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TES averaging kernel

Run3269_Seq0446_Scn004

TES Nadir Averaging Kernel for T_ATM



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Method of comparison

- Define $X = T(K)$.
- Interpolate the *in situ* data to the same 87 pressure levels as TES.
- Apply TES averaging kernel A_{TES} and the TES *a priori* constraint $X_{apriori}$ to the *in situ* data:

$$X_{sonde}^{TES_{AK}} = X_{apriori} + A_{TES} [X_{sonde}^{pTES} - X_{apriori}]$$

